

FEDERAL ENERGY REGULATORY COMMISSION
Office of Energy Projects
Division of Dam Safety and Inspections – Portland Regional Office
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7/23/2019

In reply refer to:
P-2496

Mr. Mark Zinniker
Generation Engineering Supervisor
Eugene Water and Electric Board
P.O. Box 10148
Eugene, Oregon 97440

Subject: Dam Safety Incidents near Station 120+80 and Ames, Leaburg Canal Development, Leaburg-Walterville Project

Dear Mr. Zinniker:

This letter is to acknowledge the following letters and emails from you and your staff regarding the ongoing dam safety incidents on the Leaburg Canal Development of the Leaburg-Walterville Project, FERC No. 2496:

| Letter Date | Author | Document(s) Transmitted |
|---|------------------------------------|--|
| October 5, 2018 | Mr. Mark Zinniker | Emergency Drawdown |
| October 5, 2018 | Mr. Dan Olmstead | Dam Safety Incident Report for Void near Sta 120+80 |
| October 12, 2018 | Mr. Mark Zinniker | Void Investigation and Repair Work Plan (Work Plan) |
| November 2, 2018 | Mr. Mark Zinniker | Drawdown Information |
| November 27, 2018 | Mr. Dan Olmstead | Drawdown Information |
| April 12, 2019 | Mr. Dan Olmstead | Emailed: Event Report for Sloughing near Station 125+00 |
| May 31, 2019 | Mr. Dan Olmstead | Dam Safety Incident Report for Void near Sta 243+00 |
| Beginning October 1, 2018 and continues currently | Mr. Dan Olmstead, Ms. Cheri Wilson | Emailed: Weekly Weir Flow Data for Instrumentation near Stations 120+80 and 243+00 |

We have reviewed the information submitted and provide the following discussion and comments:

Background

During the 2018 Dam Safety Inspection, D2SI-PRO staff observed an eight-foot-long void in the canal embankment at Station 120+80. Sediment has been observed accumulating in the weir box downslope of the void. D2SI-PRO September 28, 2018 letter required EWEB to complete the following items:

- Draw down Leaburg Canal in order to reduce the driving head on the piping area and limit the size of a potential breach discharge;
- Notify downslope residents and businesses of the potential danger from a failure of the canal embankment;
- Coordinate with local Emergency Management Agencies (EMAs); and
- Perform twice-daily inspections of the canal slope and weirs between Station 114+00 and 123+00.

D2SI-PRO October 24, 2018 letter required EWEB to maintain the canal water surface at or below 3.0 feet deep, as measured at the Cogswell Creek Bridge Road, and required that EWEB receive prior written authorization from D2SI-PRO before raising the water surface above that elevation. The drawdown elevation was based on a recognition the 19-foot-tall embankment, shallow phreatic head drop across the embankment, proximity to another discharge location (wasteway gate), and limited upstream canal volume would result in a relatively small breach discharge if an embankment failure were to occur near Station 120+80. Consequently, a more aggressive drawdown plan was not needed at that time.

April 2019 Precipitation Event

According to your Work Plan, the canal would be operated to maintain an elevation of 726.3 feet at the forebay “which provides a more precise description for the canal water level” and “provides a canal depth of 2.3 feet as measured at the Cogswell Creek Road Bridge.” The Work Plan goes on to explain that the canal draw down would be maintained as follows:

...automated modulation of the forebay sluice gate as necessary to maintain the targeted setpoint water surface elevation. At the targeted setpoint elevation of 726.3 feet, hydraulic calculations indicate that the 36-inch sluice gate system is capable of discharging up to approximately 225 cfs. ... In the event that the sluice gate reaches a full open condition, the control system is being set up so that operations staff receive an alarm. Our planned response to an alarm condition is to manually open the canal wasteway gate further upstream. The wasteway gate is sufficient to handle any additional accretion flows into the canal.

Between April 8 and 14, 2019, a significant precipitation event resulted in a canal water surface elevation of 730.5 feet, with the targeted drawdown elevation exceeded for six days (Enclosure, Figure 1). The following table, from Mr. Olmstead's April 17, 2019 email to Ms. Kristie Hartfeil, of this office, provides precipitation and forebay data during this event.

Table 1. Daily Precipitation Data between April 8 and 15, 2019

| Date | Daily Precipitation (in.) | Morning Forebay Water Surface Elevation (ft) |
|---------|---------------------------|--|
| 4/8/19 | 2.03 | 730.53 |
| 4/9/19 | 0 | 730.98 |
| 4/10/19 | 0.28 | 729.07 |
| 4/11/19 | 1.31 | 728.29 |
| 4/12/19 | 0.83 | 729.99 |
| 4/13/19 | 0 | 729.04 |
| 4/15/19 | 0 | 725.14 |

It is our understanding that EWEB had the sluice and wastewater gates wide open during this period, trying to maximize discharges from the canal to maintain the required water surface elevation. The precipitation event was not particularly unusual when compared to local historical data from 1964 to 2014, which we obtained from the National Climatic Data Center (NCDC). Historical data indicates annual exceedance rates of approximately 60 and 50 percent for daily precipitation depths of 2 and 2.5 inches, respectively. Given the exceedance probability, EWEB should anticipate the occurrence of such an event during the upcoming rainy season. Based on the canal water surface data from the April 2019 event, it does not appear that EWEB will be able to maintain the required drawdown water surface elevation with the current available discharge capacity.

Embankment Damage, Continuing Seepage, and Sediment Transport

Daily weir instrumentation readings since October 1, 2018 indicate continuing seepage flow and sediment accumulation in the weir at Station 120+80, even at the drawdown elevation. This is a strong indicator that internal erosion of the canal embankment continues to occur and the current drawdown is insufficient. During the April 2019 precipitation event, EWEB staff observed a 24-foot-wide by 10-foot-high slough on of the interior side of the canal embankment at Station 125+00. While the canal water surface was above the drawdown target elevation, weir flows at Station 120+80 spiked to pre-drawdown flows.

During an April 3, 2019 site visit to observe the geotechnical investigation at Station 120+80, D2SI-PRO staff observed a void above the weir box at Station 243+00

and tension cracks on the downstream face of the canal embankment near Station 237+00. The weir box at Station 243+00 is one of the oldest along the 90-year-old canal and has a history of significant seepage flows and sediment accumulation. Prior to the canal drawdown, seepage flow rates from the weir at Station 243+00 had been increasing over time. D2SI-PRO staff have observed the weir box floor covered with sediment on numerous occasions, including the April 3, 2019 inspection. During the April 2019 precipitation event, the weir recorded its second highest flow in the past fourteen years. The threshold level for the weir at Station 243+00 is 22 gpm; the maximum recorded weir flow reached nearly 30 gpm during the event (Enclosure, Figure 2). All of these factors appear to indicate that internal erosion of the canal embankment is occurring at Station 243+00.

Consequences of Failure, Station 243+00 versus Station 120+80

It should be anticipated that a breach at Station 243+00 would be significantly larger and have greater consequences than a breach at Station 120+80.

- The embankment near Station 243+00 is taller (approximately 60 feet tall) and steeper (1.2 horizontal to 1 vertical slope) than the embankment near Station 120+80.
- Residences and businesses are located immediately adjacent to the toe of the embankment.
- Station 243+00 is near the downstream end of the 5.3-mile-long canal; thus, there is a greater volume of water that could be discharged through a breach.
- Static stability analysis presented in the Supporting Technical Information Document, transmitted by Ms. Cheri Wilson's May 31, 2019 letter and currently under review by D2SI-PRO staff, indicate factors of safety of 1.23 and 1.29 for at Stations 239+00 and 246+00 at normal pool elevation. If confirmed to be correct, this means that the embankment slope has factors of safety that are less than the minimum required by FERC guidance.

Given the discussion above, you are required to do the following:

1. Complete additional coordination with EMAs. The most recent Functional Exercise of the Emergency Action Plan (EAP) was completed in September 2016 and did not exercise the evacuation of downslope residents. The Leaburg Canal Inundation Maps require EMAs to use an overlay to determine the inundation zone, which may not be intuitive to first responders. Therefore, EWEB is required to complete a Table Top Exercise of the EAP with the EMAs that includes the scenarios of a canal breach at Station 120+80 and Station 243+00. This Table Top should be completed before the onset of the rainy season, no later than November 15, 2019. Please coordinate with this office for D2SI-PRO staff attendance at the Table Top Exercise.

2. Decrease the water surface level in the Leaburg Canal. EWEB is required to make every additional effort to reduce the canal water surface to an elevation where sediment is no longer being transported at Station 243+00, or to a low enough elevation that a breach of the canal would not pose a threat to downstream lives and property.
3. Provide additional discharge capacity. During a heavy precipitation event, EWEB will be unable to maintain the required drawn down elevation with the existing gate structures. EWEB is directed to find alternative means for discharging excess flows from Leaburg Canal to maintain the required drawdown water surface elevation.

Within 30 days of the date of this letter, please respond to or submit a plan and schedule to address the comments above. Thank you for your continued cooperation and interest in dam safety. If you have any questions, please contact Ms. Kristie Hartfeil of this office at (503) 552-2731.

Sincerely,

Douglas L. Johnson, P.E.
Regional Engineer

Enclosure: Relevant Instrumentation Data

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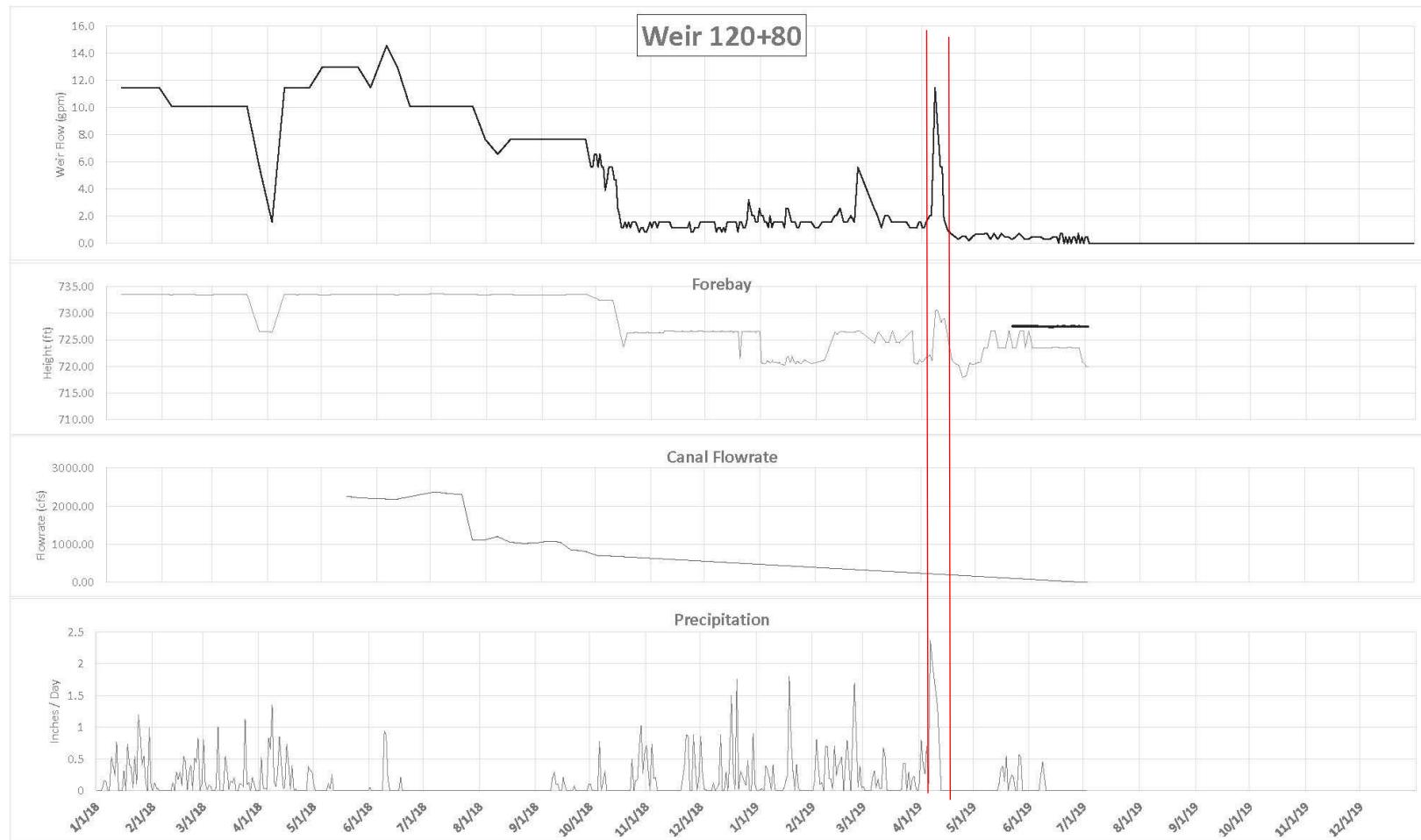


Figure 1. Seepage Flow at Weir 120+80. Note heavy precipitation event April 2019.

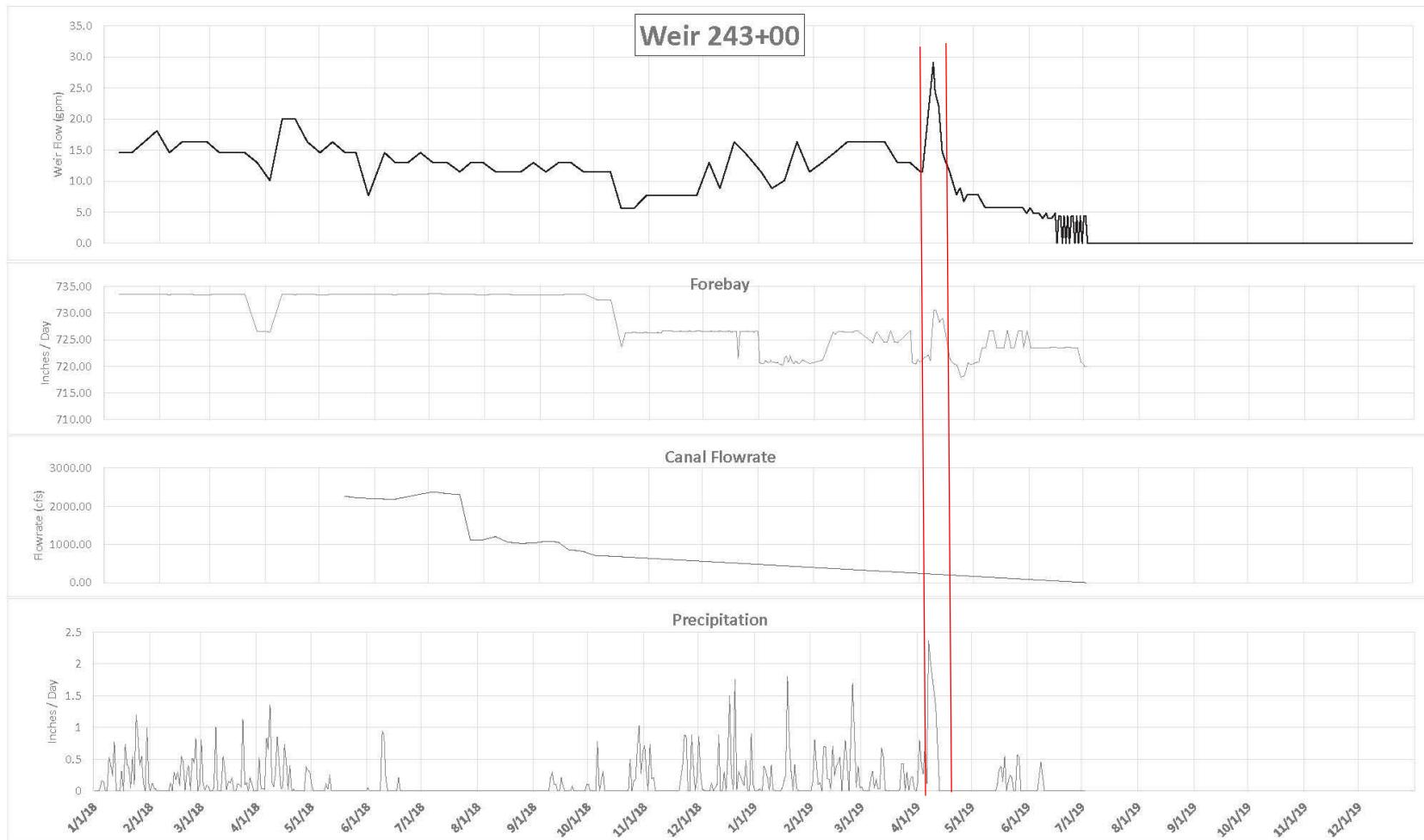


Figure 2. Seepage Flow at Weir 243+00. Note heavy precipitation event April 2019.